Galaxy Disks and Disk Galaxies
ASP Conference Series, Vol. 3×10^8, *2000*
J.G. Funes S.J., and E.M. Corsini, eds.

Kinematics and photometry as complementary tools in the study of barred galaxies

Juan Carlos Vega Beltrán, Peter Erwin, John Beckman

IAC, C. Via Láctea s/n, E-38200, La Laguna, Tenerife, Spain

Alessandro Pizzella, Enrico Maria Corsini, Francesco Bertola

Università di Padova, Dipartimento di Astronomia, Padova, Italy

Werner W. Zeilinger

Institute of Astronomy, University of Vienna, Wien, Austria

1. UGC 10205: an edge-on barred galaxy

It has been suggested that the peanut-shaped bulges seen in some edge-on galaxies are due to the presence of a central bar (Bureau & Freeman 1999; Bureau & Athanassoula 1999). Although bars cannot be detected photometrically in edge-on galaxies, Kuijken & Merrifield (1995) showed that a barred potential produces strong kinematic signatures in the form of double-peaked line-of-sight velocity distributions with a characteristic "figure-of-eight" variation with radius. As an example, in Fig. 1 (left panel) we can see two components (fast-rotating and slow-rotating) that give the emission spectrum and the velocity curve of the edge-on galaxy UGC 10205 a figure-of-eight shape (see Vega et al. 1997).

2. NGC 6221: Detecting Bar-Driven Shocks in the Gas

The case of NGC 6221 is particularly interesting because the images show numerous dust lanes within the bar, but whether these actually represent shocks in the gas flow — as predicted by numerous hydrodynamic simulations — is unclear. However, if we take into account the radial profiles of [NII]/Hα derived from long-slit spectra (see Vega et al. 1998), we can infer the presence of a pseudo-ring of shocked gas in the inner $10''$ region. If we compare the HST image with the positions of these peaks (see Fig. 2, right panel), we see that the regions of maximum [N II]/Hα occur where the slits cross the two inner, curving dust lanes which join the "leading-edge" lanes near the center of this galaxy. This suggests that the strongest shocks may occur in the two curving lanes, rather than in the leading-edge lanes.

3. NGC 4340: Double Bar + Fossil Nuclear Ring

NGC 4340 is a double-barred SB0 galaxy in the Virgo cluster (Wozniak et al. 1995). Using new optical images, we have found that it also contains a luminous stellar nuclear ring, lying just outside the inner bar. The ring is smooth and

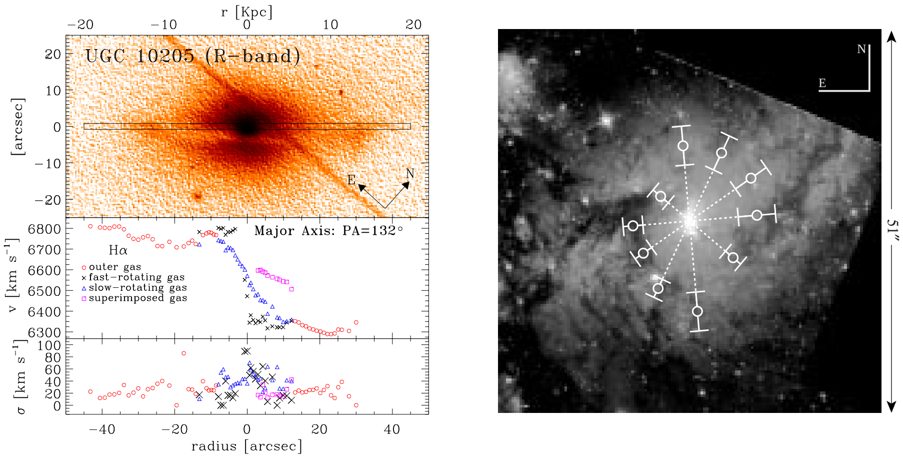

Figure 1. *Left panel*: Above, we can see a *R*-band image of the edge-on galaxy UGC 10205. The middle and the bottom windows show the velocity curve and the velocity dispersion curve of the different gaseous components present in this galaxy. *Right panel*: Archival WFPC2 image of NGC 6221 in the F606W filter (*V*-band). White lines indicate the five slit position of our spectra; location and FWHM of peaks in [NII]/Hα for each spectrum are noted.

does not differ in color from surrounding regions, which suggests it is relatively old and free of dust and gas: it may be a "fossil" remnant of an earlier gas-rich, star-forming nuclear ring.

The ring is aligned with, but more elliptical than, the outer disk, so it is intrinsically elliptical. In deprojection it trails both bars by 10–15° (the two bars are slightly misaligned, which suggests they are independently rotating). This is an unusual orientation, since most hydrodynamic simulations produce leading (gaseous) nuclear rings within bars. We use the major-axis velocity curve of Simien & Prugniel (1996) and our own spectrum along the outer-bar major axis to compute approximate resonance curves. The resulting $\Omega - \kappa/2$ curve places the inner bar within the (inner) ILR; it also suggests that the nuclear ring is at or just inside of the same ILR. (See Erwin et al. 2000 for details.)

References

Bureau, M., & Athanassoula, E. 1999, ApJ, 522, 686

Bureau, M., & Freeman, K.C. 1999, AJ, 118, 126

Erwin, P., Vega Beltrán, J.C., & Beckman. J. 2000, astro-ph/0009178

Kuijken, K., & Merrifield, M.R. 1995, ApJ, 443, L13

Simien, F. & Prugniel, Ph. 1996, A&AS, 126, 15

Vega, J.C., Corsini, E.M., Pizzella, A., & Bertola, F. 1997, A&A, 324, 485

Vega Beltrán, J.C., Zeilinger, W.W., Amico, P., Schultheis, M., Corsini, E.M., Funes, J.G., Beckman, J., & Bertola, F. 1998, A&AS, 131, 105

Wozniak, H. et al. Friedli, D., Martinet, L., Martin, P., & Bratschi, P. 1995, A&AS, 111, 115